Dietary nitrate enhances power output during the early phases of maximal intensity sprint cycling

Corry, L.R., and Gee, T.I.
School of Sport and Exercise Science, University of Lincoln

Purpose: Dietary nitrate is shown to improve exercise tolerance and muscle contractile efficiency during severe intensity exercise, leading to improved cycling time-trial performance within a range of distances (4-16 km) (Lansley et al., 2011). One proposed mechanism for nitrate's ergogenic effect is related to enhanced efficiency of the ATP-PC system (Bailey et al., 2010). However, it is unknown whether dietary nitrate will affect maximal intensity cycling exercise lasting less than 30 s. The purpose of the study was to investigate whether supplementation of dietary nitrate has an ergogenic effect on 30 s sprint cycling exercise.

Methods: In a randomised single-blind crossover study, ten recreationally active males were recruited (Mean ± SD, age: 20.4 ± 0.5 years, stature: 1.82 ± 0.06 m, body mass: 75.7 ± 10.8 kg). In a counterbalanced fashion participants consumed 0.14 L of either nitrate rich concentrated beetroot juice (8 mmol.NO_3^{-1}) or placebo (blackcurrant juice with negligible nitrate content) the day before and 40 min prior to testing, separated by a seven day washout period. Following a familiarisation session, a maximal intensity 30 s Wingate cycling test was performed on three occasions under the following conditions; nitrate supplementation, placebo supplementation and control. Statistical analysis methods were used that reported the uncertainty of outcomes as 90% confidence intervals, making probabilistic magnitude-based inferences concerning the true value of outcomes using the methods described by Batterham and Hopkins (2006).

Results: Following nitrate supplementation there was a 'possible' increase in mean power (7.95 ± 0.55 w.kg^{-1}) during the 30 s sprint compared to control (7.78 ± 0.61 w.kg^{-1}) and placebo conditions (7.63 ± 0.91 w.kg^{-1}) (*47% chance; 90% CI: -0.089 - 0.43 w.kg^{-1}*). On further analysis of the trial, via division into 5 s phases; participants experienced 'likely' increases in mean power during 5-10 s and 10-15 s phases of the test following nitrate supplementation compared to control and placebo conditions (5-10 s; *77% chance; 90% CI: -0.013 – 0.65 w.kg^{-1}*, 10-15 s; 81% chance; *90% CI: 0.05 – 0.57 w.kg^{-1}*).

Conclusions: The consumption of dietary nitrate, seemingly enhanced power output between the 5 to 15 s phase of the maximal intensity cycle sprint, this occurred despite nitrate having no distinctive effect on overall 30 s cycling performance.

References

Bailey, S.J., Fulford, J., Vanhatalo, A., Winyard, P.G., Blackwell, J.R., DiMenna, F.J., Wilkerson, D.P., Benjamin, N., and Jones, A.M. (2010) Dietary nitrate supplementation enhances muscle contractile efficiency during knee-extensor exercise in humans. *Journal of Applied Physiology*. 109(1): 135-148.

Batterham A.M., and Hopkins, W.G. (2006) Making meaningful inferences about magnitudes. *International Journal of Sports Physiology and Performance*. 3(4): 547–557.

Lansley, K.E., Winyard, P.G., Bailey, S.J., Vanhatalo, A., Wilkerson, D.P., Blackwell, J.R., Gilchrist, M., Benjamin, N., and Jones, A.M. (2011) Acute dietary nitrate supplementation improves cycling time trial performance. *Medicine & Science in Sports & Exercise*. 43(6): 1125-1131.